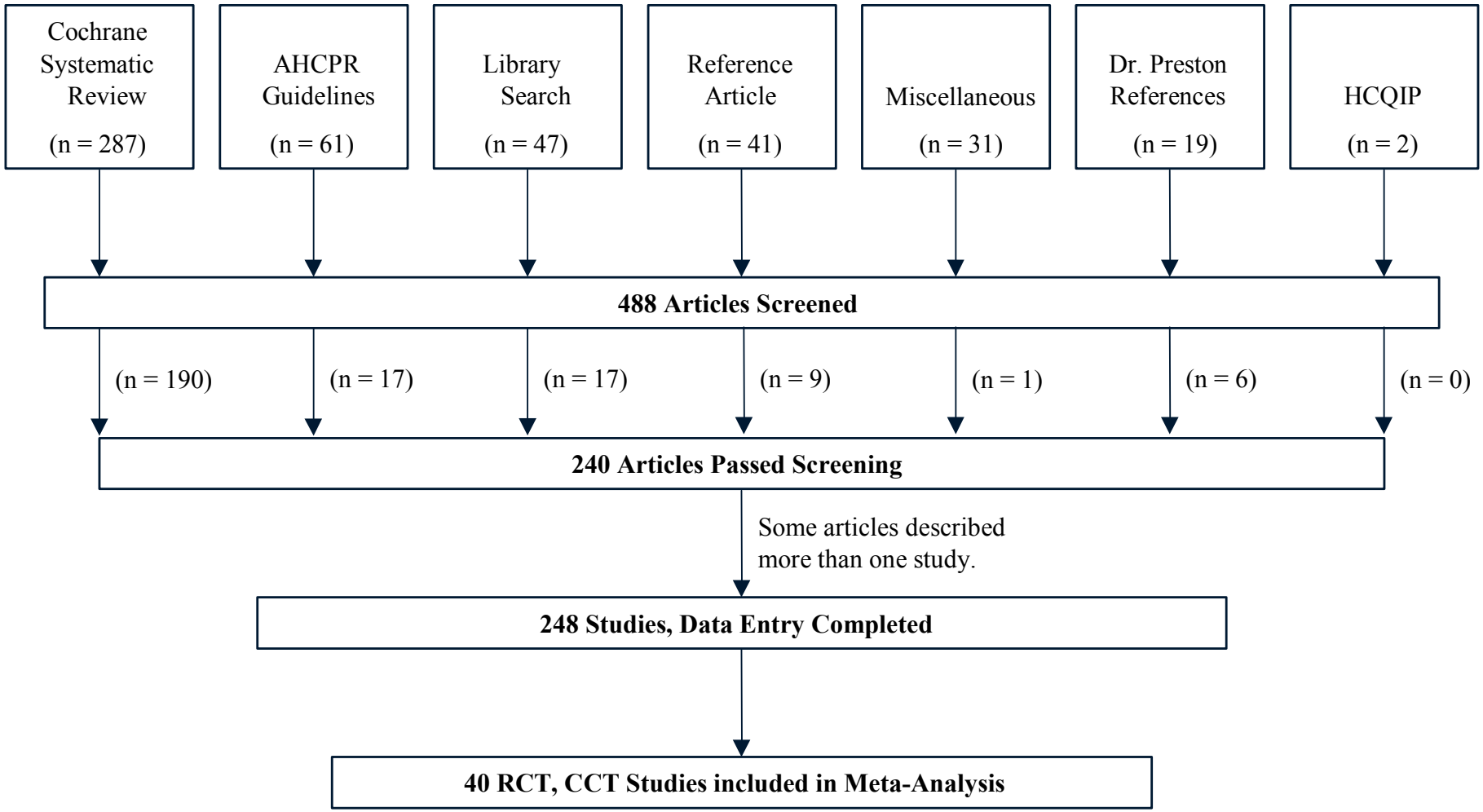
RESULTS

IDENTIFICATION OF EVIDENCE

Figure 4 describes the flow of evidence from the original sources to final acceptance for our review. The Cochrane library contained 287 relevant articles, the Public Health Service clinical practice guideline[18] referenced 61 articles not contained in Cochrane, and 41 additional articles were referenced in previous reviews on smoking cessation. Dr. Jeanette Preston, Principal Investigator of our smoking cessation demonstration project, sent 19 additional articles. A final library search yielded 47 recently published articles that were not contained in the former sources. The database for the Health Care Quality Improvement Projects contained only two reports on smoking cessation. Finally, 31 miscellaneous articles were identified from nonreview article reference lists and through suggestions from experts in the field.

Figure 4. Flow of Evidence



DISTRIBUTION OF EVIDENCE

Table 4 presents the 248 studies we examined, stratified by service and broad characterization of intervention. Note that some studies addressed several interventions; therefore, the total sums to more than 248.

The intervention type that appeared in the greatest number of studies was patient education (149 studies), followed by individual counseling (118 studies). One-hundred four studies included self-help interventions, while 76 studies considered patient financial incentives. Once again, these categories were not mutually exclusive. For example, a patient could receive both education and group counseling simultaneously in a study. The number of interventions/arms ranged from one to nine; the average number of interventions was between two and three.

Table 4. Interventions by Type

Intervention	# of studies*
Education without detailing/ outreach	
Patient	149
Provider	31
Provider detailing	3
Provider feedback	1
Financial/administrative intervention	
Patient	76
Provider	2
Organization	1
Reminders	
Patient	33
Provider	15
Group therapy/ counseling	
Leader trained	52
Leader not trained	32
Individual counseling	118
Mass media, community intervention	6
Regulatory	
Patient	0
Provider	0
Organization	1
Medications	
Nicotine replacement	
Gum	74
Patch	36
Nasal Spray	9
Clonidine	6
Antidepressants	6
Anxiolytics	5
Mecamylamine	3
Other	21
Self-help	104
Organizational (process) change	8

* The numbers of studies in this column do not sum to the total number of articles because many studies use multiple interventions.

DESCRIPTION OF EVIDENCE

The tables in Appendix 1 present the following descriptive information for each study that met our acceptance criteria:

- The author, year, country of origin, and study design.
- The age and vulnerable population targeted in the study.
- The target of the intervention (patients, provider type, organizations, communities).
- The study's setting (academic or nonacademic), the geographic setting (urban/suburban or rural), and the setting's reimbursement system (HMO, fee-for-service, mixed).
- The interventions being compared (e.g., control versus patient education, provider reminder versus provider reminder plus patient education).
- The characteristics of the interventions (population size [N], baseline rate, and follow-up rate).
- The smoking cessation rate in the control and intervention groups.

QUALITY OF EVIDENCE

Of the 248 separate studies included in our analysis, 202 were randomized clinical trials (RCT), 32 were controlled clinical trials, 13 were controlled before/after studies, and 1 was an interrupted time series. Thus, the majority of studies used RCT, the study design with the strongest internal validity. Studies measured smoking cessation by patient self-report, by biochemical validation, or by both. We assessed with meta-regression whether use of self-report or biomedical validation was associated with bias in the estimated efficacy of interventions, controlling for other study-level variables. The adjusted odds ratio for all studies using biochemical validation was 2.62 (95% C.I.=2.38 to 2.87), while for self-report, the adjusted odds ratio was 2.48 (95% C.I.=2.21 to 2.78). Therefore, there is no evidence of bias in the estimate of efficacy as a function of method for measuring smoking cessation.

DESCRIPTION OF RESULTS

QUESTION 1. HOW SHOULD PROVIDERS BE REIMBURSED?

We found no direct evidence that any particular reimbursement system for providers is better than the others. (That is, there were no studies that compared smoking cessation outcomes as a function of different reimbursement schemes.) There did, however, appear to be a relationship between length of counseling time and smoking cessation outcomes. This is detailed in Question 6 below.

QUESTION 2. HOW USEFUL IS PROVIDER TRAINING?

A recent meta-analysis[19] found 11 studies of the effect of provider education on both provider performance and patient smoking cessation rates. Some of these studies, published from 1988 through 1996, were required to report smoking cessation rates of at least six months after the intervention period. Two articles reported updates on previously published articles, leaving nine separate studies to be analyzed. Eight of these studies reported the effect of training medical practitioners, and one reported the effect of training dental practitioners. All of the studies were conducted in North America. The provider training in all studies was conducted on a group basis, in either a tutorial or a workshop format. Various methods were employed, including videos, role-playing, discussion, and didactic lectures. The content for most of these educational interventions included setting quit dates and offering patient follow-up.

The results of this review showed that trained providers are significantly more likely to perform smoking-cessation tasks than untrained providers. Patient outcomes are also affected. Patients who saw trained providers were more likely to stop smoking than those who saw untrained providers (pooled odds ratio 1.48, 95% C.I.=1.20 to 1.83).

QUESTION 3. HOW SHOULD PROVIDER COMPLIANCE BE MEASURED AND MONITORED?

We found no studies in the medical literature that addressed the measuring and monitoring of provider compliance in smoking cessation interventions. Patient compliance was often measured by biochemical means such as serum cotinine, breath carbon monoxide, and thiocynate.

QUESTION 4 & 5. WHAT MEANS CAN BE USED TO CURB OVERUTILIZATION AND HOW EFFECTIVE ARE PATIENT FINANCIAL INCENTIVES?

One article studied effectiveness and cost-effectiveness of different levels of coverage for both a behavior modification benefit and a nicotine replacement benefit for smoking cessation. This study was performed at a health maintenance organization in the Pacific Northwest and involved over 90,000 patients.[20] The four benefit strategies are shown in Table 5.

Table 5. Cost-sharing Plans Analyzed

Plan	Behavior Benefit	Nicotine Replacement Benefit	Cost/ Quitter
Full	100%	100%	$1171
Standard	50%	100%	$797
Flipped	100%	50%	$870
Reduced	50%	50%	$801

The most cost-effective benefit plans (from the health plan perspective) were found to be those in which the patients bore some financial responsibility for the smoking cessation program. However, full coverage of both benefits resulted in more quitters (approximately two to four times as many quitters in the full benefit plan as in the reduced coverage plans).

We found no studies that specifically addressed curbing overutilization or the effect of capitation limits on services. Our expert panel emphasized that overutilization should not be a problem, and that we should concentrate on convincing smokers to engage in cessation interventions.

QUESTION 6 & 7. HOW EFFECTIVE IS TELEPHONE AND OTHER COUNSELING?

Individual counseling was statistically significantly superior to self-help (which was only marginally different than control). A number of systemic reviews have reported on various aspects of counseling for smoking cessation.[17, 18, 21-23] Results from a meta-analysis performed for the 2000 Public Health Service clinical practice guideline[18] show that all forms of counseling are statistically significantly effective at promoting smoking cessation. In the meta-analysis, individual counseling yielded the highest adjusted odds ratio for success, followed by group counseling, phone counseling, and self help. The greater effectiveness of individual counseling over telephone counseling approached statistical significance. There was no statistically significant difference in effectiveness between group counseling and telephone counseling. In another quantitative systematic review that examined only physician counseling,[21] 16 trials reporting the effect of brief advice on smoking cessation had a pooled odds ratio of 1.69 (95% C.I.=1.45 to 1.98). Intensive counseling was also found to be more effective than minimal advice, with a pooled odds ratio of 1.44 (95% C.I.=1.23 to 1.68).

A recent meta-analysis of five studies[23] found group counseling more effective than no intervention or minimal contact, with a pooled odds ratio of 1.91 (95% C.I.=1.20 to 3.04). In two trials that compared group counseling directly with individual counseling, there were no statistically significant differences between the two interventions.

The 1996 AHCPR systematic review[17] revealed an apparent dose-response curve between the amount of counseling and the smoking cessation rate. For contact less than or equal to three minutes, the adjusted odds ratio was 1.2 (95% C.I.=1.0 to 1.5), and for contact longer than 10 minutes, the adjusted odds ratio increased to 2.4 (95% C.I.=2.1 to 2.7). Counseling lasting

between three and 10 minutes had an intermediate adjusted odds ratio of 1.4 (95% C.I.=1.2 to 1.7). Results from the Public Health Service clinical practice guideline show a similar trend.[18] According to the guidelines, there is a similar relationship for the duration of individual counseling. Counseling with a duration of less than two weeks was found to be less effective than counseling that lasted more than eight weeks (adjusted odds ratio of 1.1 versus 2.7). Counseling lasting between two and eight weeks showed intermediate effectiveness (adjusted odds ratio of 1.6). The number of counseling sessions also showed a similar dose-response relationship, with a trend toward increasing smoking cessation rates with increasing number of individual treatment sessions up to seven sessions. The preliminary results from the update show an odds ratio of 1.4 (95% C.I.=1.1 to 1.7) for two to three sessions, an odds ratio of 1.9 (95% C.I.=1.6 to 2.2) for four to eight sessions, and an odds ratio of 2.3 (95% C.I.=2.1 to 3.0) for more than eight sessions.

In conclusion, all forms of counseling have statistically significant effects on smoking cessation, with individual counseling appearing to be the most effective method. Dose-response curves are available for length of time spent on each counseling session, number of sessions, and total duration of counseling intervention.

QUESTION 8. HOW EFFECTIVE IS PHARMACOTHERAPY?

In a recent meta-analysis of 91 trials,[24] NRT was found to be more effective than control in smoking cessation, with a pooled odds ratio of 1.72 (95% C.I.=1.60 to 1.84). Different forms of NRT showed moderately different results, as displayed in Table 6. Since the confidence intervals around these estimates of effect overlapped, there was no evidence of a significant difference in the effectiveness of the five types of NRT. The 2000 Public Health Service clinical practice guideline notes a very similar trend in odds ratios.[18]

Table 6. Effectiveness of Nicotine Replacement Therapy versus Control

Delivery Mechanism	Pooled Odds ratio
Gum (49 studies)	1.63
Sublingual tablet (2 studies)	1.73
Patch (32 studies)	1.77
Inhaled nicotine (4 studies)	2.08
Nasal spray (4 studies)	2.27

Buproprion, an antidepressant sold as Wellbutrin, is currently marketed toward smokers under the name Zyban and is currently the only FDA approved drug for smoking cessation other than NRT. A recent quantitative systematic review[25] reported a pooled odds ratio of 2.73 (95% C.I.=1.90 to 3.94) for four studies that compared results for buproprion users with those for a control group. The same review also reported that two studies of nortriptyline (a tricyclic antidepressant) had a pooled odds ratio of 2.83 (95% C.I.=1.59 to 1.03).

Three quantitative systematic reviews on clonidine[17, 26, 27] (which included six studies, seven studies, and 10 studies, respectively) reported pooled odds ratios of 1.89 (95% C.I.=1.30 to 2.74) and 3.0 (95% C.I.=1.5 to 5.9), respectively, for the first two studies, and a quit rate of 5.7% (95% C.I. = –1.3% to 12.7%) in the third study for clonidine compared with control. There was, however, a high incidence of dose-dependent side effects, particularly sedation and dry mouth. Clonidine is used to treat hypertension and has not been approved by the FDA for smoking cessation.

Two quantitative systematic reviews[17, 25] found no effectiveness for anxiolytics such as buspirone, diazepam, or meprobamate.

QUESTION 9. HOW EFFECTIVE IS SELF-HELP?

Two systematic reviews have reported results on self-help interventions.[17, 22] In the first,[22] a meta-analysis of 25 studies reported a pooled odds ratio of 1.23 (95% C.I.=1.01 to 1.51)

compared with control. In the second,[17] a meta-analysis of twelve studies, the pooled odds ratio was 1.2 (95% C.I. 0.97 to 1.6) compared with control. Similar preliminary results were noted in the Public Health Service clinical practice guideline.[18] These data indicate that self-help materials have a small practical effect on smoking cessation.

Studies of helpline/hotline forms of self-help, used alone, had an odds ratio of 1.4 (95% C.I.=1.1 to 1.8). There is no evidence that adding self-help materials to individual counseling or nicotine replacement therapy improved smoking cessation rates.[22]

QUESTION 10. WHAT PRACTICE SETTINGS ARE MORE EFFECTIVE?

Interventions for patients hospitalized with smoking-related illness

In their 1996 guidelines, the AHCPR recommended that all smokers be assisted with quitting during any hospitalization, using any treatment identified as effective by AHCPR. This was also recommended by the new Public Health Service clinical practice guideline.[18] Hospitalization gives patients a unique opportunity to quit smoking, as all U.S. hospitals are smoke-free. In addition, the hospitalization may have been caused by a smoking-related illness, thus increasing awareness of the dangers of smoking. We considered conducting a meta-regression on hospital interventions versus usual care in hospitals, but this was not possible for several reasons. First, many studies did not use a pure control group. For example, some studies of NRT for hospitalized patients gave the placebo group counseling, self-help literature, etc. In many cases, the difference between NRT and placebo was insignificant if both groups were provided with counseling and follow-up. Second, the populations studied differed in their reasons for hospitalization. For example, some studies included only cardiac patients. while others excluded cardiac patients. Most important, the interventions used were very heterogeneous. Table 7 describes these interventions.

The highest quit rates were found in two studies of cardiac patients.[28, 29] The high rates may have occurred because the immediacy of the situation was apparent to the patients. However, the reported rates may be biased upward, and there was no biochemical confirmation of smoking cessation. In studies where cotinine or carbon monoxide was used to verify self-reports (most other studies), cessation rates were far below those reported in the two studies that relied solely on self-reports. In general, interventions with follow-up calls or visits were shown to be more successful than those without, except in the Rigotti study (1997).

Table 7. Interventions with Hospitalized Patients

First Author	Year	Population	N	Intervention	Quit Rate	Months	Verified
Burt	1974	Male heart attack survivors	125	Dogmatic advice to quit, pamphlet, follow-up by community nurse	62.0%	12	No
			85	Conventional advice to quit	27.5%	12	No
Campbell	1991	Patients with smoking-related respiratory or cardiovascular disease	106	Advice to quit, follow-up by counselor at 2,3,5,13, and 26 weeks, placebo gum	20.0%	12	Yes
			106	Advice to quit, follow-up by counselor at 2,3,5,13 and 26 weeks, nicotine gum	20.0%	12	Yes
Stevens	1993	All smokers hospitalized over 36 hours, expect post-partum or substance abusers	453	20 minute counseling session, 12 minute video, self-help materials, one or two follow-up calls	13.5%	12	No
			666	Usual care	9.2%	12	No
Campbell	1996	Patients with smoking-related respiratory or cardiovascular disease	119	Advice to quit, follow-up by counselor at 2,4,8, and 12 weeks, placebo patch	14.0%	12	Yes
			115	Advice to quit, follow-up by counselor at 2,4,8, and 12 weeks, nicotine patch	21.0%	12	Yes
Taylor	1996	Smokers hospitalized over 36 hours	315	Meeting with nurse case manager, use of videotape, workbook, relaxation tape, NRT, and follow-up calls	31.0%	12	Yes
			313	Usual care	21.0%	12	Yes
Simon	1997	Smokers who underwent non-cardiac surgery	168	Counseling, videotape, self-help literature, NRT, 3 months phone follow-up	15.0%	12	Yes
			156	10 minute brief counseling, self-help literature	8.0%	12	Yes
Rigotti	1997	Smokers hospitalized over 48 hours, excluding intensive care, cognitively impaired	325	15 minute bedside counseling, self help literature, up to 3 weekly phone calls	8.1%	6	Yes
			325	Usual care	8.7%	6	Yes
Rosal	1998	Coronary patients	82	30 minute counseling session, one outpatient counseling visit, follow-up calls	49.0%	60	No
			78	10 minute advice to quit	40.0%	60	No
Lewis	1998	Smokers admitted > 24 hours, excluding drug or alcohol abusers, psychiatric patients, pregnant women, terminal illness, intensive care, major cardiac condition	61	Brief physician motivational message, pamphlet	4.9%	6	Yes
			62	Counseling, nicotine patch, telephone counseling	9.7%	6	Yes
			62	Counseling, placebo patch, telephone counseling	6.5%	6	Yes

Free-standing smoking cessation programs

There are very few inpatient or residential programs designed specifically for smoking cessation. However, in Minnesota, both Hazelden and the Mayo Clinic have such programs. Between 1990 and 1997, almost 400 people were admitted to Hazelden's five-day residential smoking cessation program which uses a 12-step philosophy, cognitive behavioral therapy, stress management, massage, and acupuncture. About two-thirds of the clients were recovering from drug or alcohol addiction (Hazelden's primary focus). The facility reports that about 35% of clients were smoke-free at one-year follow-up.[40]

In 1988, the Mayo Clinic tested the feasibility of a 14-day inpatient program designed to treat nicotine dependence. Modeled after similar programs for drug users, the program combined behavioral, chemical-dependence, and transdermal NRT in a smoke-free environment. The subjects underwent follow-up for 10 weeks after departure and were contacted periodically thereafter. At one year, 29% of the 24 subjects were smoke-free.[41]

The Nicotine Dependence Center at the Mayo Clinic also provides a range of outpatient treatments. An evening group program consists of a series of six sessions, each of which includes an hour of group therapy and a one-hour lecture on specific related topics.[42] The relapse-prevention program consists of follow-up phone calls at one, three, and six months after initial consultation, eight mailed letters, and a one-year follow-up survey. Clients from 1988, the first year of the program, had a one-year quit rate of 20.3%.[43]

The American Cancer Society (ACS) and the American Lung Association (ALA) also conduct smoking cessation clinics. Lando[44] compared a program he designed with their programs in a randomized trial that took place in three Iowa locations. The ACS program consisted of an orientation session plus four one-hour group sessions over a two-week period. Instructions to

clinic leaders placed relatively more weight on individual situations than on group processes. There was no set target date for abstinence. The ALA clinic format consisted of an orientation session and seven additional 90- to 120-minute sessions over a seven-week period. Quit Day occurred at the third session, and the remaining sessions were focused upon maintenance and a healthy lifestyle. Lando's treatment consisted of 16 sessions (45 to 60 minutes each) over a nine-week period. The first three weeks were devoted to preparation for quitting, and the final six, to maintenance. The preparation technique involved switching brands on a 30-60-90 percent weekly reduction schedule. Lando also used an aversive smoke-holding procedure.[45]

Although differences in one-year point prevalence were not significant, there were significant differences in one-year sustained abstinence. Sustained abstinence for the ACS program was 12.08%, compared with 19.01% for the ALA program and 22.19% for the Lando program ($p<0.014$). In addition, significantly fewer clients from the ACS program made a quit attempt ($p<0.004$).

In sum, the few published articles on residential/inpatient smoking cessation programs did not meet our standards for rigor. Importantly, neither study included a control group. In addition, the Hazelden report did not confirm abstinence through biochemical means. Thus, we can not make a statement about the effectiveness of such programs. The only study we found of outpatient smoking cessation clinics was a randomized trial. Although this study did not have a pure control group, it does support recent meta-analysis results indicating that more intensive programs lead to increased success.

QUESTION 11. WHO IS MORE EFFECTIVE IN DELIVERING SMOKING CESSATION INTERVENTIONS?

We identified one systematic review that assessed nursing interventions specifically, and two meta-analyses that assessed the relative effectiveness of different providers. We also conducted our own meta-regression analysis focussing on the relative effectiveness of different providers.

In a systematic review of 14 studies specifically focusing on nursing interventions,[32] smoking cessation rates improved over usual care (odds ratio=1.43, 95% C.I.=1.24 to 1.66). Interventions included cessation advice, counseling, and psychological feedback.

A systematic review of 41 studies comparing nonmedical healthcare providers (social workers, counselors, psychologists), nonphysician medical care providers (pharmacists, nurses, dentists) and physician providers found no statistically significant differences in smoking cessation rates among patients who saw these various providers. The pooled odds ratio was 1.8% (95% C.I.=1.5 to 2.2) for nonmedical providers, 1.4 (95% C.I.=1.1 to 1.8) for nonphysician medical providers, and 1.5 (95% C.I.=1.2 to 1.9) for physicians.[17] However, interventions using multiple providers were found to be more effective than interventions using a single provider (pooled odds ratio=2.8, 95% C.I.=2.6 to 5.6).

In the recent Public Health Service clinical practice guideline the difference between physicians and non-physician clinicians approached statistical significance. The odds-ratios are presented in the table below.

Table 8. Efficacy of Interventions Delivered by Various Types of Clinicians

Type of Clinician	Estimated Odds Ratio	95% C.I.	Estimated Abstinence Rate	95% C.I.
No clinician	1.0		10.2	
Self-Help	1.1	0.9-1.3	10.9	9.1-12.7
Nonphysician clinician	1.7	1.3-2.1	15.8	12.8-18.8
Physician clinician	2.2	1.5-3.2	19.9	13.7-26.2

We conducted a meta-regression containing 56 arms comparing an intervention with a control

group. The results are given in Table 9.

Table 9. Meta-regression Results by Provider

Provider	Adjusted Odds Ratio	95% C.I.
Physician	3.02	2.62-3.48
Psychiatrist/psychologist	2.68	1.79-4.00
Nurse	2.38	1.87-3.03
Counselor	1.87	1.35-2.61
Unknown	1.41	1.09-1.83
Other (self-help, etc)	1.37	1.15-1.65

The trend indicates that physicians are the most effective intervention providers, compared with control, followed by psychiatrists/psychologists, then nurses. Physicians had a statistically significant advantage over lay counselors, self-help, and interventions where provider was unknown. Interventions using psychiatrists/psychologists and nurses were shown to be significantly more effective than self-help or interventions with unknown provider type.

In summary, the data support that many types of providers are effective. In two of three comparative meta-analyses, physician providers compared to non-physician providers had a higher estimated odds ratio of effectiveness, and in one synthesis this difference was statistically significant.

QUESTION 12. DO CERTAIN INTERVENTIONS WORK BETTER FOR SPECIAL POPULATIONS?

Hispanics / Latinos

We found a single controlled trial of smoking cessation interventions designed specifically for Latinos. In Queens, New York, Nevid and Javier[46] compared a culturally specific multicomponent intervention with a low-intensity, enhanced self-help control. The intervention

group (N=78) met weekly to watch videos containing culturally specific smoking-related vignettes. Members of each group were of the same gender. The sessions followed a staging model in which exposure to motivation enhancement exercises was followed by relapse-prevention training in later sessions. The control group (N=75) attended an introductory session and received supportive follow-up telephone calls. Both intervention and control groups were given the ALA smoking cessation manual, *Freedom from Smoking in 20 Days* (in both English and Spanish), as well as a Spanish-language help booklet, *Guia para Dejar de Fumar*.

Unfortunately, only two participants (one in the control group, one in the intervention) demonstrated cotinine-validated abstinence at both post-treatment and 12-month follow-up. Thus, the benefits of this particular culturally specific, multicomponent intervention for Latinos/Latinas are questionable and certainly do not persist over time.

African Americans

Although the vast majority of smoking studies consist primarily of Caucasian subjects, several studies have evaluated smoking cessation interventions designed specifically for African Americans. The most recent studies are described below.

Ahluwalia and colleagues[47] conducted a double-blind, randomized controlled trial at a hospital outpatient program for inner-city African Americans. The multifaceted intervention included brief counseling, a culturally appropriate cessation guide written at sixth-grade level, and either a nicotine patch or a placebo patch. In addition, patients were reimbursed for transportation costs. The six-month self-reported quit rate was 17.1% for the nicotine patch group and 11.7% for the placebo patch group ($p < .08$).

Fisher[48] studied a community intervention in low-income African American neighborhoods in St. Louis. The intervention included smoking cessation classes, billboards, a gospel fest, and

door-to-door distribution of self-help materials. Over two years, smoking prevalence decreased from 34% to 27% in program neighborhoods, and from 34% to 33% in control neighborhoods in Kansas City.

Schorling and colleagues[49] studied a church-based intervention in rural Virginia which combined one-on-one counseling with self-help materials and communitywide activities. The intervention was implemented throughout one county, while a similar county served as a control. There was a significant change in subjects' stages of change in the intervention county compared with the stages of change in the control county. Although the smoking cessation rate was higher in the intervention county, the difference was not statistically significant.

In the 1980's, the Harlem Health Connection developed and tested a culturally sensitive self-help smoking cessation program[50] based on Prochaska's stages of change.[51] Members of the intervention group received a culturally sensitive cessation guide written at fifth-grade level, a cessation video featuring African American historical figures, and a telephone booster call. The control group received health education materials not directly addressing smoking. There was no significant difference in quit rates between the intervention group and the control group at six-month follow-up.

Goldberg[52] designed an intervention based on the stages of change which involved training medical residents to provide brief counseling to patients. The intervention took place in the outpatient section of Chicago's Cook County Hospital, where over 90% of the patients are African American. The trained residents saw patients in the intervention group, while residents who did not undergo the training saw the control group. Although the intervention group moved ahead in stages of change, the difference in quit rates between the groups was not statistically significant.

In summary, one of the five studies targeted toward African American populations showed statistically significant improvements in smoking cessation compared to control. No studies have been reported that demonstrate reduced or enhanced effectiveness of generic smoking cessation interventions among different ethnic/racial groups. Thus, we encourage studies on generic interventions to publish results stratified by these groups. In addition, more research on the effectiveness of targeted versus generic interventions is needed.

QUESTION 13 & 14. WHAT ARE THE COSTS AND COST EFFECTIVENESS OF INTERVENTIONS?

This section will discuss the cost and cost-effectiveness of different interventions studied in this review, including counseling, self-help and mass media. It is important to note that medications are sometimes combined with these interventions. Few articles except for those specifically on cost-effectiveness detail costs. Table 10 lists the average wholesale cost per dose and cost per day for these medications.[33]

Table 10. Costs of Smoking Cessation Medications (average wholesale price)

Medication	Cost per dose	Cost per day
Nicotine patch	$3 each	$3
Nicotine inhaler	$1/ 10mg	$1.50
OTC Nicotine gum	$0.50/ piece	$5
Bupropion	$1.40/ 150 mg pill	$2.80
Clonidine*	$0.25/ 0.2mg pill	$0.50

* not FDA approved for smoking cessation

Which interventions are most cost-effective?

The available evidence suggests that smoking cessation interventions are highly cost-effective when compared with other medical treatments and prevention programs.[18, 34] The widely held view of smoking cessation as the "gold standard" of healthcare cost-effectiveness is underscored by the fact that even the least cost-effective smoking intervention — the use of nicotine gum as

an adjunct to physician counseling — is estimated to cost less than half the median cost per life-year saved of nearly 600 life-saving interventions.[35]

We reviewed 15 published studies examining the cost-effectiveness (C/E) of various smoking cessation programs and three review articles. Eight of the cost-effectiveness analyses (CEA) were medical practice-based and seven were community-based interventions. In general, community-based programs tended to be less cost-effective than practice-based interventions. Further, practice-based interventions generally applied more rigorous methodologies such as randomized clinical trials. All of the studies discussed below and outlined in Table 11 examined adult smokers, yet none solely targeted the elderly.

Table 11. Summary of Cost-effectiveness of Smoking Cessation Interventions in 1999 dollars

Interventions	Cost effectiveness*	Characteristics	Reference
		Medical practice-based interventions	
Counseling only	$317	Brief advice in U.K. (3 minutes)	Parrott, 1998[53]
Counseling and self-help material	$403	Brief advice in U.K. (4 minutes)	Parrot, 1998[53]
	$5,928	Minimal individual (3 minutes)	Cromwell, 1997[27]
	$4,696	Brief individual (7 minutes)	" "
	$2,237	Full individual (15 minutes)	" "
	$2,690	Intensive individual	" "
	$1,635	Intensive group	" "
Counseling, self-help material and NRT	$490 (patch)	Brief advice in U.K. (7 minutes)	Parrott, 1998[53]
	$3,551 (patch)	Minimal individual (6 minutes)	Cromwell, 1997[27]
	$6,707 (gum)	Minimal individual (6 minutes)	" "
Adding NRT to physician counseling	$686 ~ $1,354 (patch)	Under Age 35 up to 65 years in U.K.	Stapleton, 1999[54]
	$1,963 ~ $2,603 (patch)	Men age 35-64	Wasley, 1997[55]
	$3,224 (patch)	Men age 65-69	" "
	$3,323 ~ $4,000	Women age 35-64	" "
	$5,069 (patch)	Women age 65-69	" "
	$4,799 ~ $8,808 / QALYS (patch)	Men age 25-64	Fiscella, 1996[56]
	$11,963 / QALYS (patch)	Men age 65-69	" "
	$5,417 ~ $6,851 / QALYS (patch)	Women age 25-64	" "
	$7,634 / QALYS (patch)	Women age 65-69	" "
	$6,368 ~ $8,085 (gum)	Men age 35-64	Oster, 1986[57]
	$10,010 (gum)	Men age 65-69	" "
	$10,652 ~ $13,929 (gum)	Women age 35-64	" "
	$14,400 (gum)	Women age 65-69	" "
Hospital programs	$254	Nurse-managed program for acute MI patients	Krumholz, 1993[58]
	$1,901 - $8,368	Hospital-based (counseling, video, self-help, follow-up phone calls)	Meenan, 1998[59]
Specialist clinics	$ 465	Specialist service in addition to physician counseling and NRT (U.K.)	Parrott, 1998[53]
	$7,872	Mayo Clinic with a variety of intervention approaches	Croghan, 1997[42]

Table 11. Summary of Cost-effectiveness of Smoking Cessation Interventions in 1999 dollars (continued)

Interventions	Cost effectiveness*	Characteristics	Reference
	Community-based interventions		
Self-help / quit contests	$264/quitter	1 yr	Altman, 1987[60]
	$909-$2,113/quitter	1 yr (1979 dollars)	Davis, 1984[61]
Mass media	$596 - $1,286	Television spots and phone helpline (U.K.)	Ratcliffe, 1997[62]
	$1,538-$1,721	(Sweden)	" "
	$55/quitter	At 1 yr (television spots were free)	Danaher, 1984[63]
Workplace programs	$2.05/$1 cost-benefit ratio	18 months - Health promotion program.	Bertera, 1990[64]
State initiatives	CA: decline of 3.9 packs/capita/yr	Effect of 8 advertising strategies to prevent smoking in CA and MA.	Goldman, 1998[65]
	MA: decline of 0.5 packs/capita/yr		" "

* Cost-effectiveness expressed as cost per life year saved in 1999 dollars in both the table and the text, unless otherwise noted.

Medical Practice-Based Interventions

Before the advent of NRT in the 1980s, smoking cessation programs largely consisted of self-help guides and physician exhortations to quit.[18, 34] Yet once NRT was widely shown to increase cessation rates, it became a critical component of most smoking interventions. Recent studies by Cromwell et al.[27] and Parrott et al.[53] examined the cost-effectiveness of adding self-help and nicotine replacement therapy to physician counseling. Cromwell and colleagues analyzed 15 interventions based on clinical practice guidelines outlined by AHRQ (formerly AHCPR).[17] The interventions included five counseling options (minimal, brief, full, individual intensive, and group intensive), either alone or in conjunction with two types of nicotine replacement therapy (transdermal nicotine patch or nicotine gum). Outcome measures included cost per quitter, cost per life-year saved, and cost per quality-adjusted life-year (QALY), and C/E ratios were computed relative to use of self-help materials only. Cromwell et al. estimated that the cost per life year saved ranged from $1,635 to $6,707 across the various interventions. Furthermore,

more intensive counseling and counseling combined with a nicotine patch were more cost-effective than other counseling options or counseling with nicotine gum.

Parrott et al.[53] examined similar interventions, yet reached somewhat different conclusions. Parrott and colleagues estimated the cost per life year saved due to the interventions was less than $500. In addition, counseling in conjunction with a nicotine patch cost more per life-year saved than counseling alone or counseling with self-help materials. This finding is consistent with Warner's observation that costs increase faster than effectiveness. It is difficult to compare findings across studies because they rely on different methodologies, patient populations, and health care environments (U.K. vs U.S.). For example, the studies by Parrott and Cromwell assumed widely different relapse rates, counseling time, and required physician wage rates. Further, they evaluated the effectiveness of the interventions against somewhat different controls.

Four additional studies estimated the cost-effectiveness of adding pharmacotherapy to provider counseling. Three of the studies estimated the marginal impact of nicotine patches,[54-56] while Oster et al.[57] examined nicotine gum as an adjunct to counseling. Oster et al. found that nicotine gum in combination with physician counseling cost $6400 to $14400 per life year saved above physician counseling only, depending on the participants age and gender. This compares favorably with other medical interventions, but based on current estimates, is less cost-effective than nicotine patches and counseling. The three "patch" studies yielded C/E ratios ranging from roughly $700 to $7000 per life year saved. Stapleton et al.[54] found more favorable C/E due to lower medical costs in the U.K. than the U.S. and greater patient cost-sharing of NRT. Fiscella and Franks[56] reported the least favorable effect of nicotine patches, largely because they assumed higher use of pharmacotherapy per smoker and lower effectiveness rates compared to Wasley et

al.[55] All four studies of NRT provided age-specific C/E ratios, and three of the four found that cost-effectiveness declined modestly with age.

Other practice-based smoking cessation interventions included hospital-based programs and specialist clinics. Because these programs were often operated by nonphysician clinicians (e.g., nurses, counselors), costs per-minute of counseling were substantially lower than physician-based approaches. Moreover, they typically involved more intensive treatment and thus achieved higher quit rates, especially among smokers who had failed in less-intensive treatments. The principal limitation of these types of specialized programs is that they fail to reach the vast majority of smokers.

Community-Based Interventions

Several researchers have examined the effectiveness of advertising and mass media campaigns that encourage smokers to quit or discourage youth from starting to smoke.[62, 63, 65] Community-based interventions typically reach a far broader audience of smokers and nonsmokers than practice-based programs. For example, a brief mass-media campaign in Scotland resulted in over 82,000 calls to a telephone quitline, and was modestly successful in increasing quit rates.[62] Another community-based study by Altman et al.[60] compared the effectiveness of a smoking cessation class, an incentive-based quit contest, and a self-help smoking kit. They found the smoking cessation class was the most effective in reducing smoking prevalence, while the self-help kit was the most cost-effective.

A recent meta-analysis of anti-smoking advertisements indicates that the content and delivery of mass media campaigns have direct impact on participation rates and effectiveness. Goldman et al.[65] found that more aggressive anti-smoking campaigns are more effective in reducing tobacco

consumption. Further, ads that emphasize industry manipulation and secondhand smoke were believed to be the most effective in a review of evidence from 186 focus groups.

Studies of smoking cessation in the workplace are often part of larger programs concerned with health promotion and prevention. These studies differ from most smoking cessation programs in that the principal outcome measure is workloss or disability days rather than quit rates or costs per quitter. Bertera[64] evaluated a large, multi-site health promotion program using a pre- and post-control group design. Disability days declined more than 8 percentage points over two years for hourly employees who participated in health promotion classes and self-help programs -- including smoking cessation -- compared to the control groups. While findings from workplace-based programs appear to be highly effective, it is difficult to assess the impact of specific smoking interventions when they are part of broader health promotion programs.

All of the studies reviewed saved life-years at a cost as low as several hundred dollars to a high of $14,000, with a median value of about $5,000 per life year saved. These findings are well below the estimates of most other health interventions. The principal shortcoming of this literature is a lack of evidence on the effectiveness of smoking cessation programs for specific patient subgroups -- such as the elderly -- and their preferences for specific interventions. As Warner[34] noted, different interventions are effective for different people. A resource-intensive treatment may be cost effective for smokers who do not respond to less-intensive programs, but may not be successful for smokers attempting to quit for the first time. Further investigation is needed to determine the cost-effectiveness of various smoking cessation interventions on specific patient populations.